Aug. 7, 1934. H. L. T. BUCKLE 1,968,927

TALKING MACHINE

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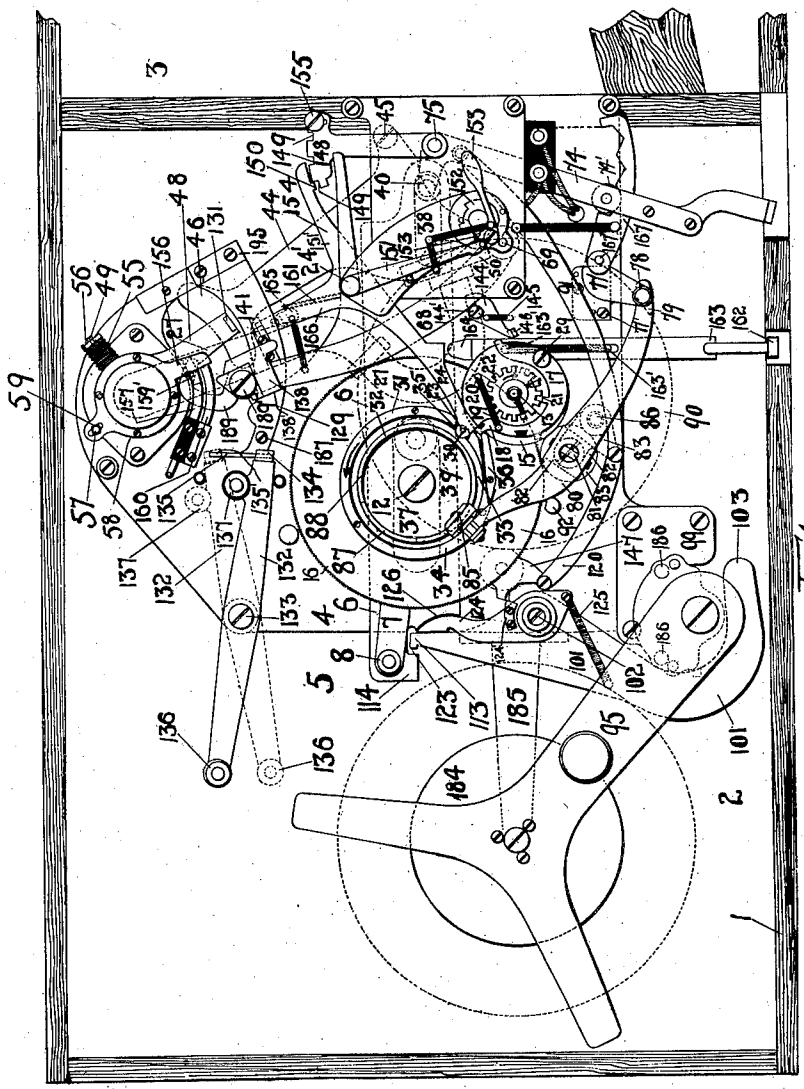


Fig. 1.

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TALKING MACHINE

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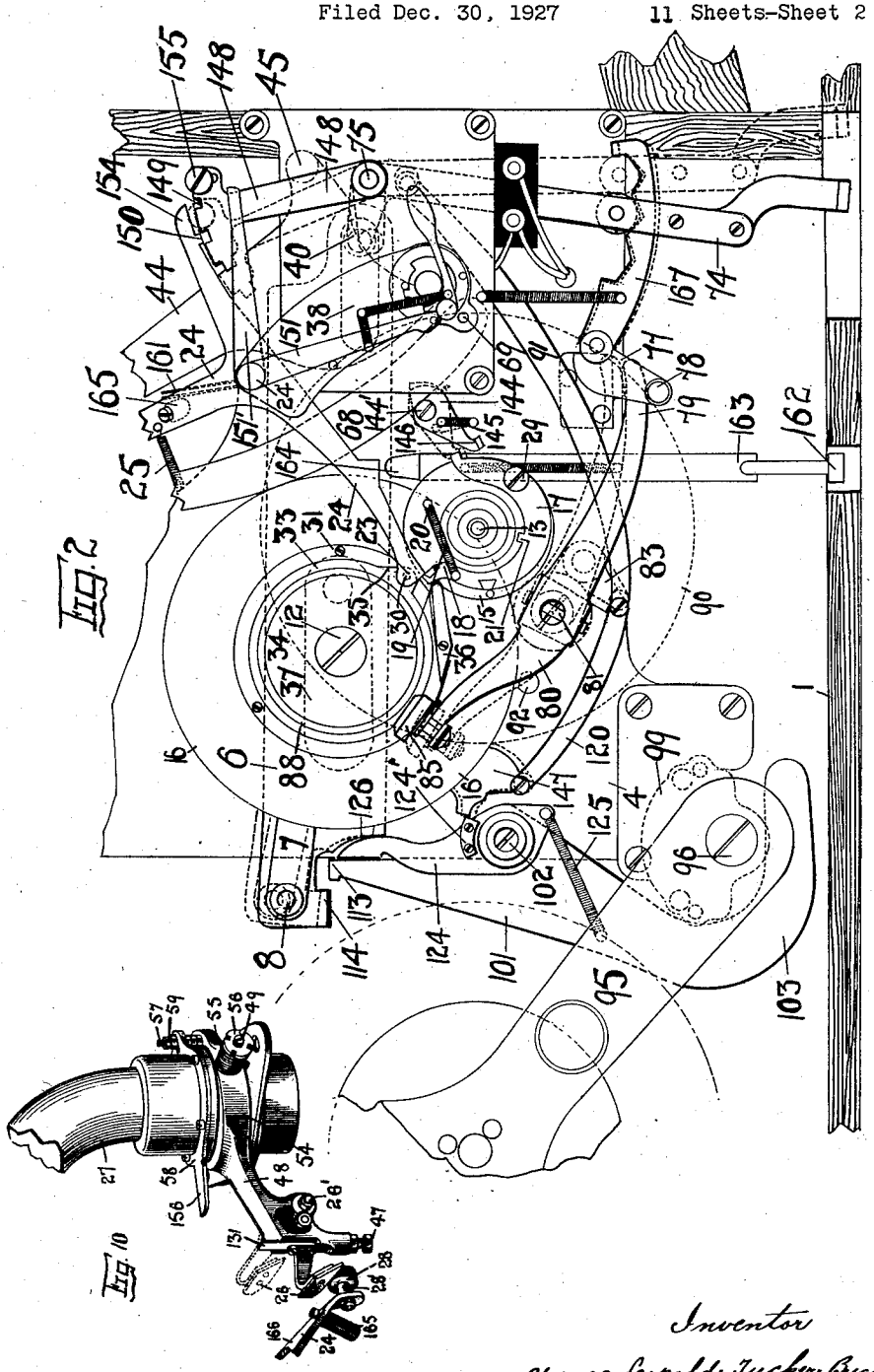


Fig. 2

Fig. 10

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TALKING MACHINE

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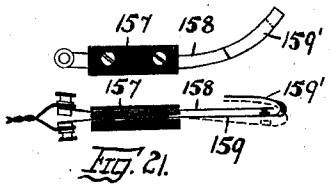


Fig. 21.

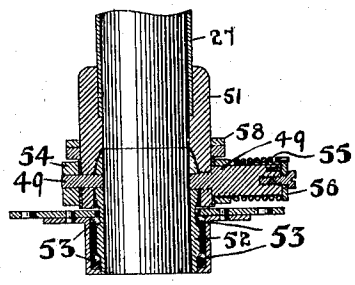


Fig. 11.

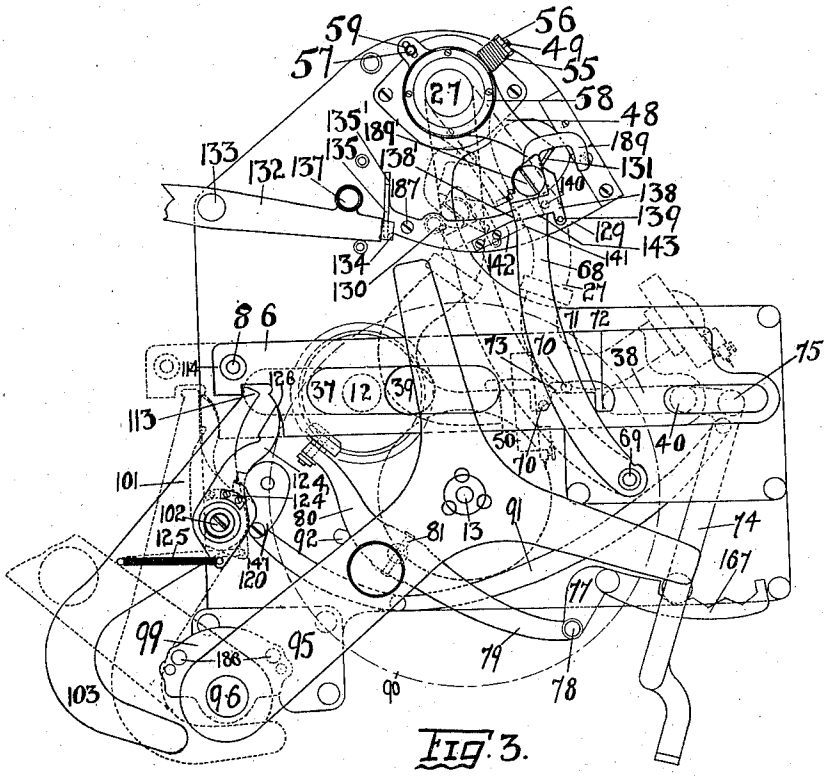


Fig. 3.

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TALKING MACHINE

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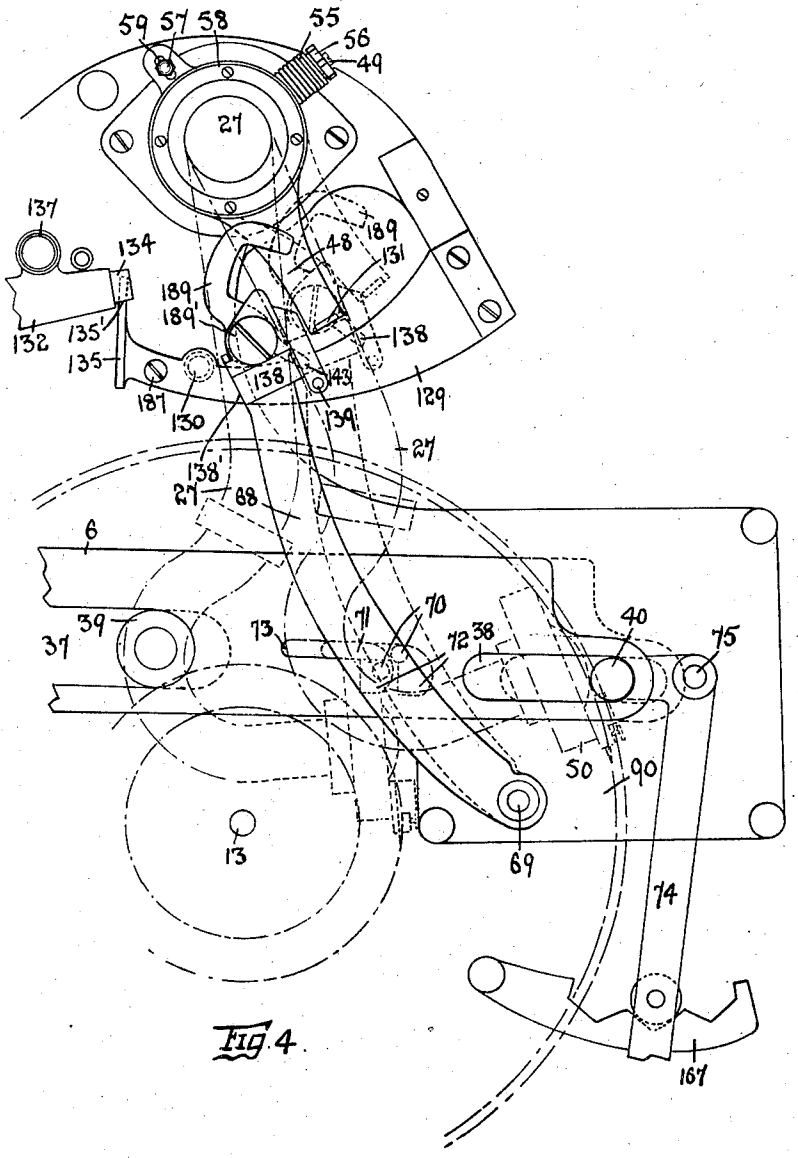


Fig. 4.

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TALKING MACHINE

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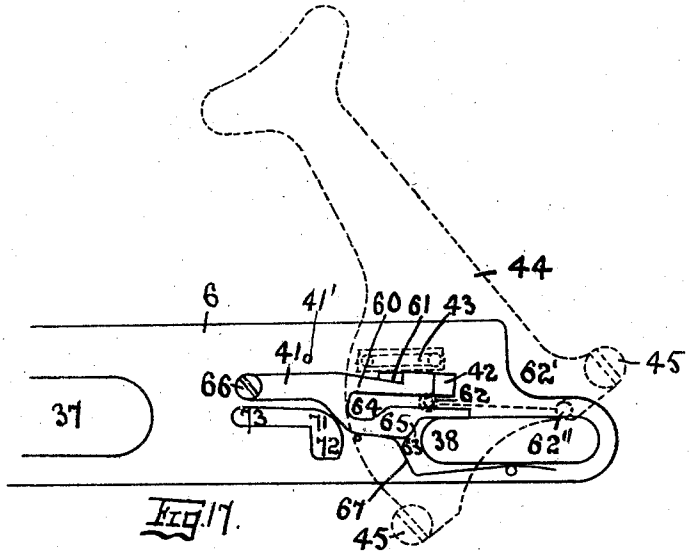


Fig. 17.

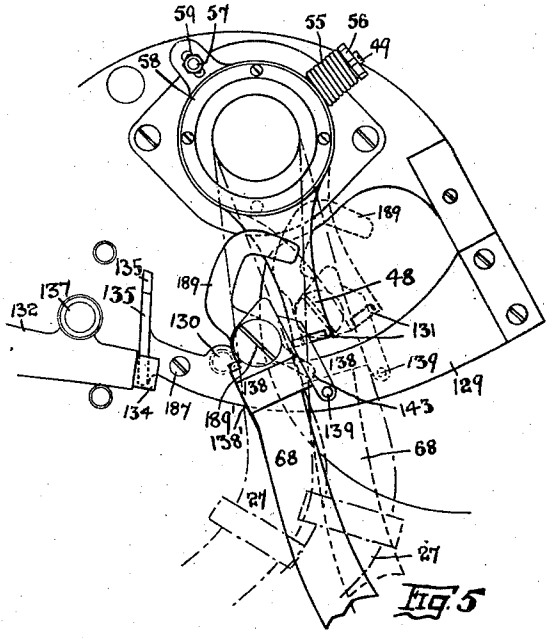


Fig. 5

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Aug. 7, 1934. H. L. T. BUCKLE 1,968,927

TALKING MACHINE

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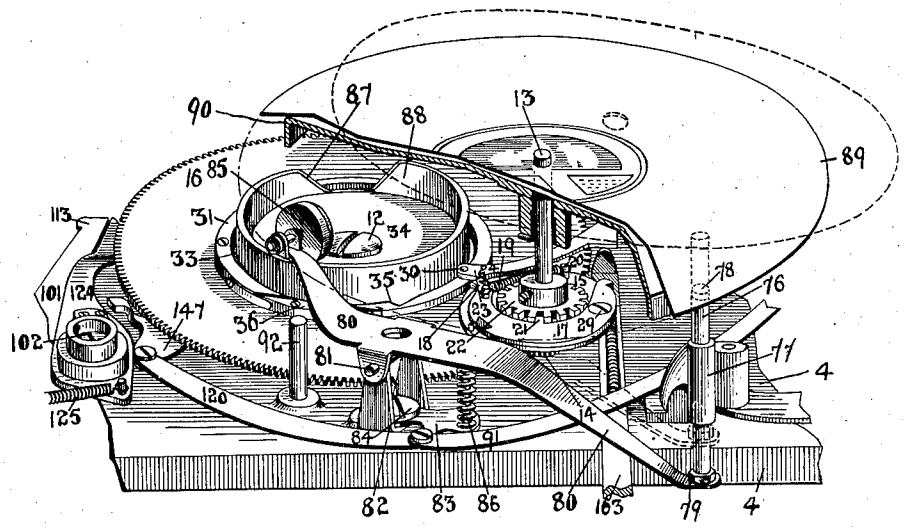


FIG. 6.

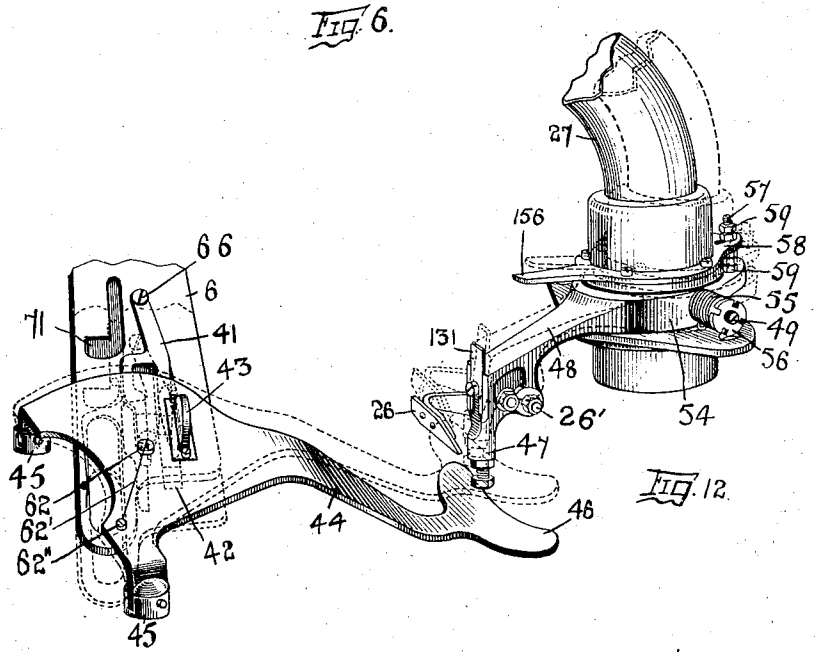


FIG. 12.

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TALKING MACHINE

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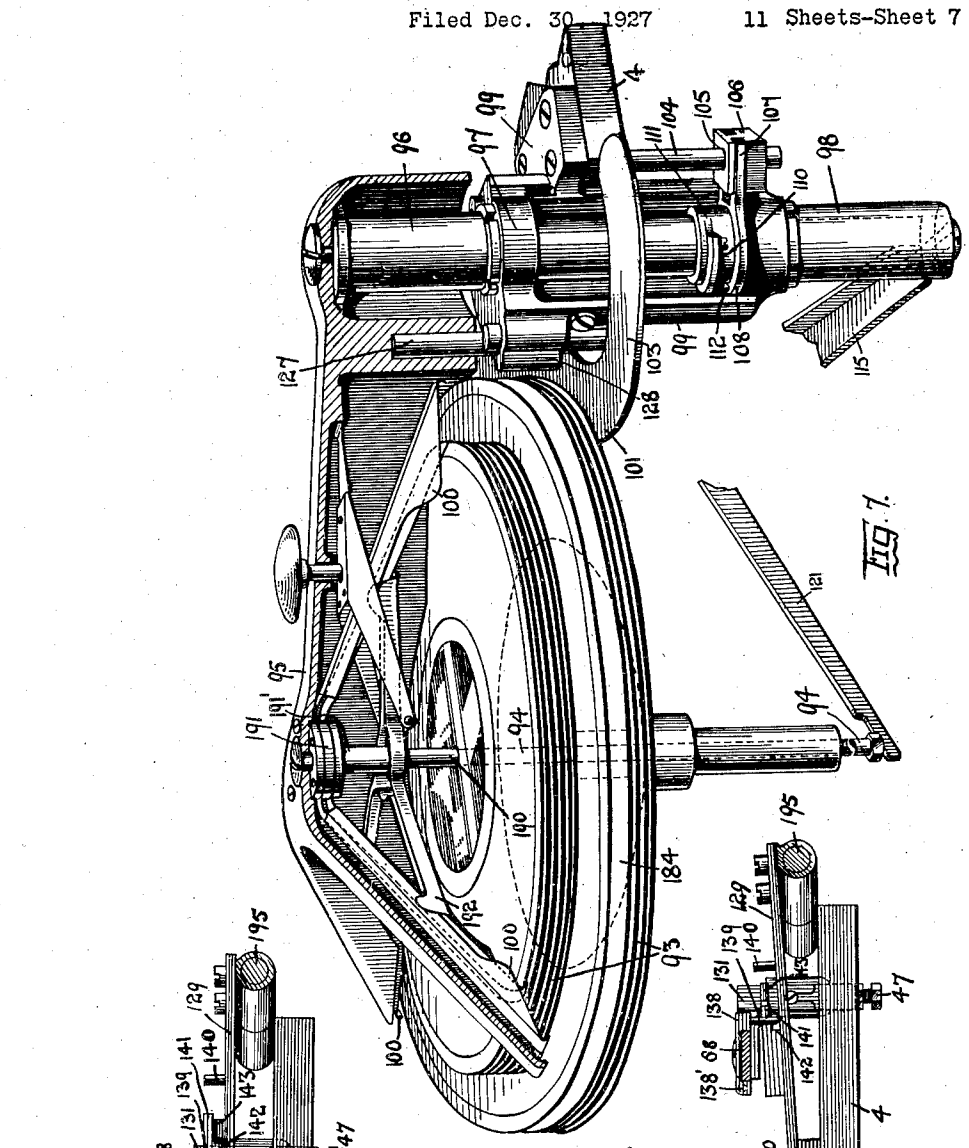


Fig. 7.

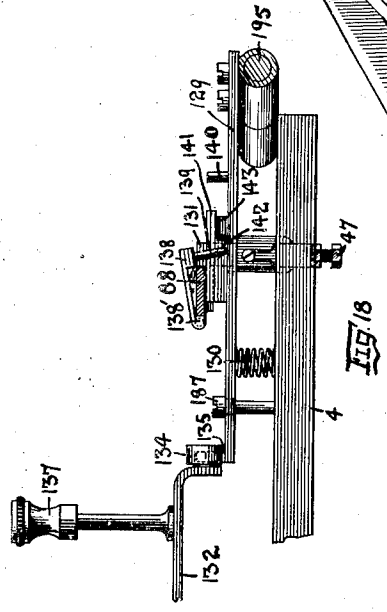


Fig. 18

Fig. 19.

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TALKING MACHINE

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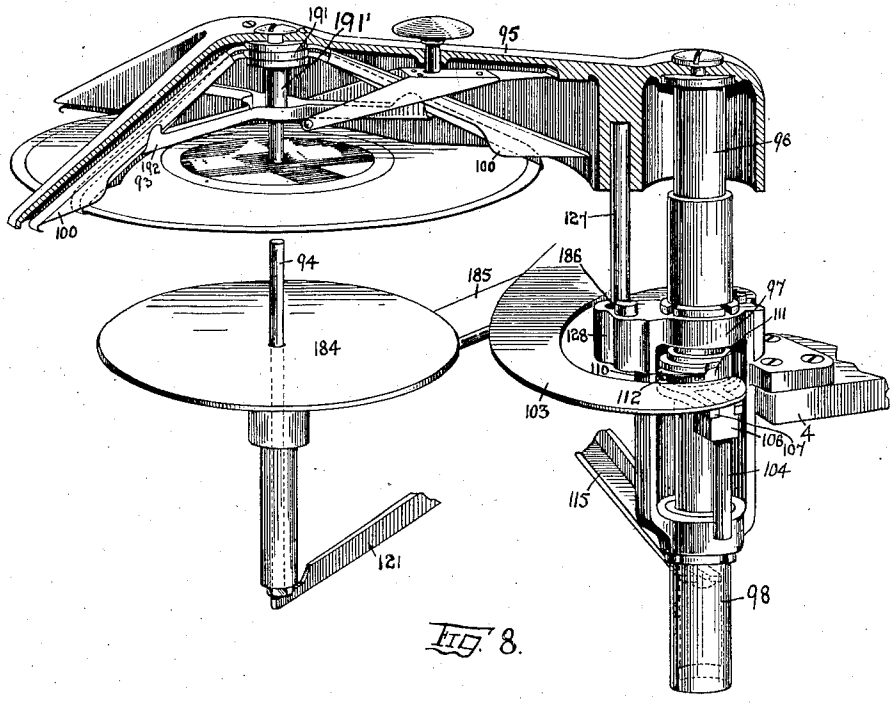


Fig. 8.

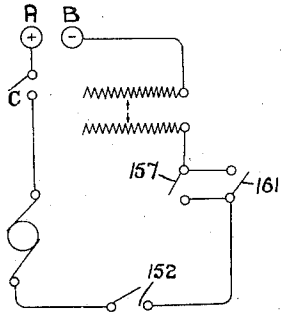


Fig. 24.

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TALKING MACHINE

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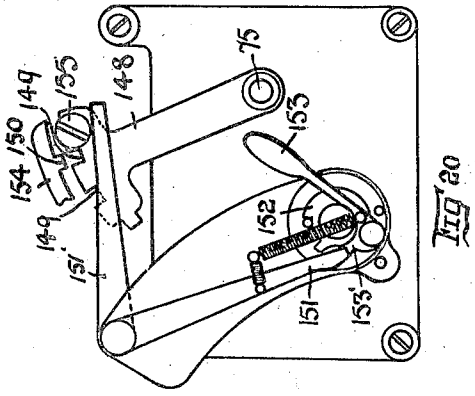


Fig 20

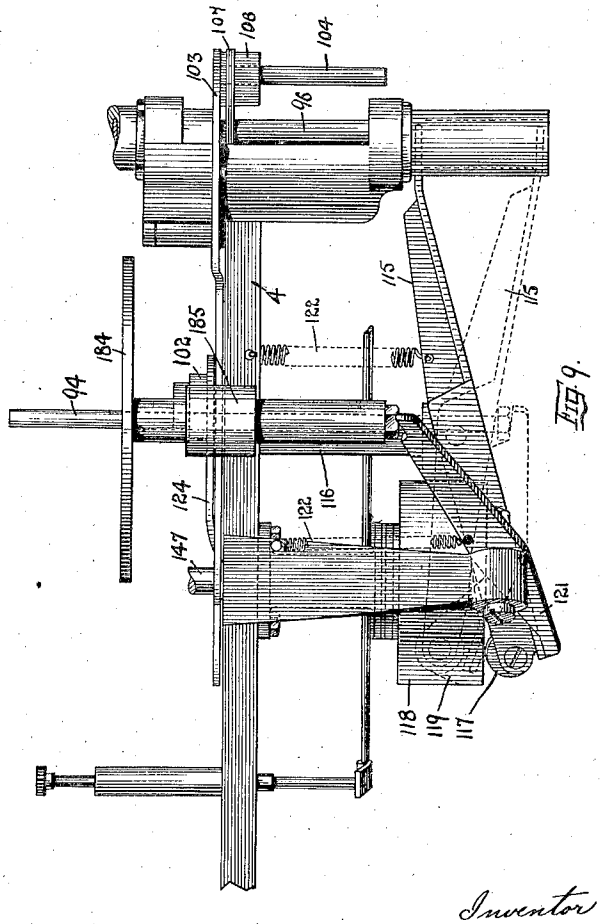


Fig 9.

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TALKING MACHINE

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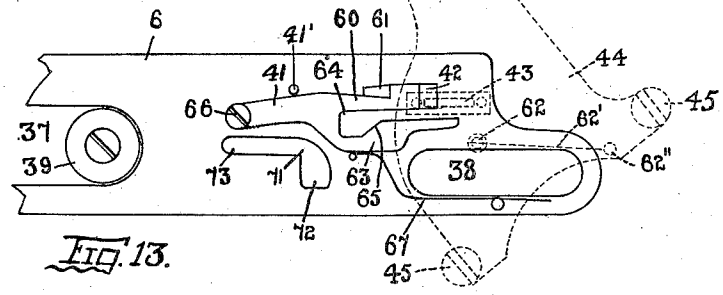


FIG. 13.

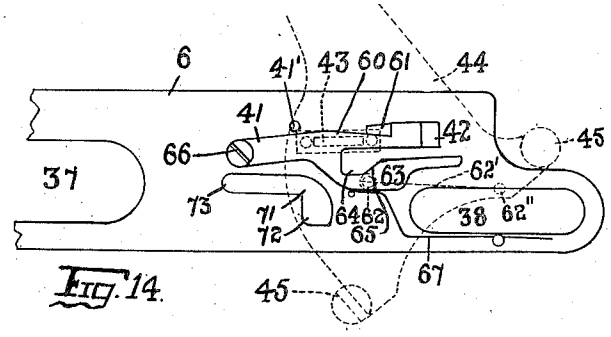


FIG. 14.

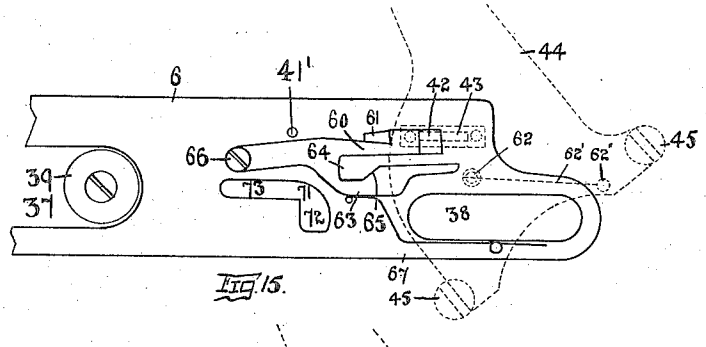


FIG. 15.

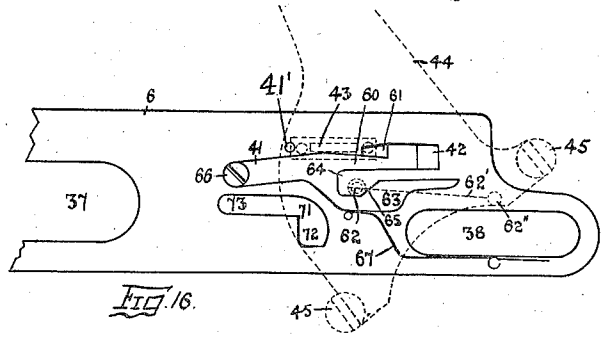


FIG. 16.

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TALKING MACHINE

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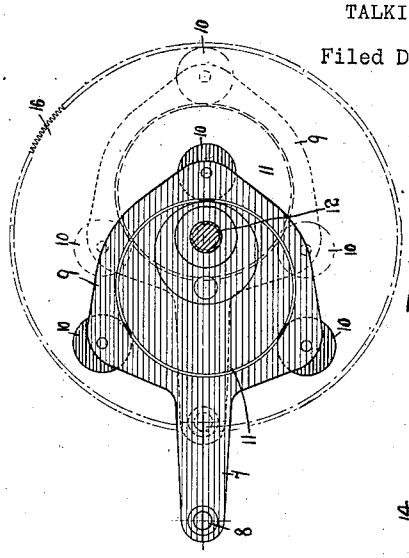


Fig. 23.

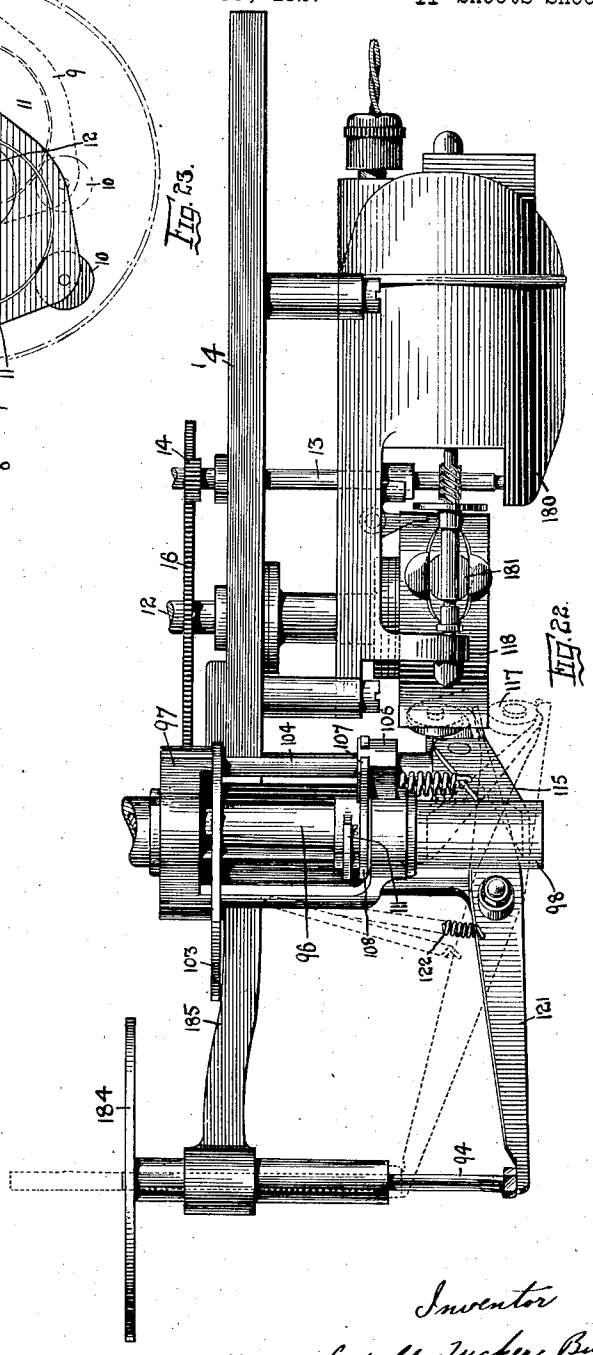


Fig. 22.

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Patented Aug. 7, 1934

1,968,927

UNITED STATES PATENT OFFICE

1,968,927

TALKING MACHINE

Horace Leopold Tucker Buckle, Iver Heath, England, assignor, by mesne assignments, to Radio Corporation of America, New York, N. Y., a corporation of Delaware

Application December 30, 1927, Serial No. 243,712
In Great Britain January 18, 1927

30 Claims. (Cl. 274—10)

This invention relates to improvements in talking machines and more particularly to talking machines of the kind which are adapted for continuous sound reproduction, whether by playing a succession of records automatically furnished for example from a magazine or by the repeated playing of the same record.

Among the objects of the invention are to provide a machine in which the sound box may be lifted, lowered and swung outwards by a member driven intermittently from the motor of the machine, the extent of the swinging movements being variable both automatically and manually.

A further object of the invention is to provide a machine which is adapted for use either as a magazine machine in which a number of records contained in a magazine can automatically be moved in succession into the playing position, played and automatically removed, or as a repeater machine to repeat the playing of a single record as often as desired.

A further object of the invention is to provide a machine which may be used either as a magazine machine, a repeating machine or an ordinary machine manually operated.

A further object of the invention is to provide a machine in which the change-over from one form of operation to another may be effected at will by the manipulation of a suitable control.

A further object of the invention is to provide an automatic magazine machine with which records of different sizes may be played.

According to the invention, a machine of the kind referred to is provided in which the sound box lifting, lowering and swinging means adapted to be driven intermittently from the motor of the machine co-operates on the one hand with a sound box lifting and lowering lever and on the other hand with a sound box swinging lever.

The member driven intermittently by the motor may be in the form of a reciprocable plate carrying a cam surface which is adapted to co-operate with a sound box lifting member for raising and lowering the sound box or other form of reproducer.

The member driven intermittently by the motor may be so mounted that without its drive from the motor being affected it can be moved into alternative positions, so that when driven it will produce upon the sound box lifting, lowering and swinging mechanism movements of different extent, periodicity or rapidity.

The movement of the intermittently driven member into alternative positions may also serve to connect or disconnect said member with or from means for feeding a new record to the machine.

The means for moving the sound arm outwards may be in the form of a swinging lever operated by the member intermittently driven from the motor and auxiliary means may be provided to co-operate with the lever to move the sound arm outwards through distances corresponding to the diameter of the record to be played. These auxiliary means may be caused to occupy a plurality of positions according to the size of the record to be played and the positioning of said auxiliary means may be effected either manually or automatically by a record in the course of the transfer of said record from the magazine to the turntable.

During magazine operation the sound arm is moved outwards, before playing is commenced, to a point beyond the edge of the largest record and means are provided to subsequently move said sound arm inwards to a point over the commencement of a record, said means being adapted to release the sound arm at an appropriate point corresponding to the size of the record to be played. The release of the sound arm at the appropriate point may be effected by the auxiliary sound arm positioning means referred to above.

During magazine operation, when the magazine is emptied and the last played record is removed from the turn table the sound arm is permitted to fall to a position below the playing position in which position it operates a switch to open the motor circuit and thereby stop the machine.

The intermittently driven member is driven from the motor through a clutch device which is put in either by hand to start the machine or automatically during playing when the end of a record is reached by the rocking of a detent member. This detent, when operated manually to start the machine, closes a switch arranged in shunt with the switch previously referred to, so that the machine can be started even when the sound arm is in its lowest position.

Means are provided to prevent the clutch from being put in when the machine is set to operate as an ordinary machine even when the detent is rocked and in this case the movement of the detent when playing of a record is finished may be utilized to operate an automatic stopping device which during magazine and repeater operation remains inoperative.

The record transferring mechanism is preferably of the kind in which the records are moved from the magazine in which they are arranged in a pile, by a horizontally swinging arm carrying

record engaging and releasing means such as is described in my co-pending application Serial No. 243,713, filed December 30, 1927, now Patent No. 1,935,140, granted November 14, 1933.

It is for obvious reasons undesirable that the control member shall be operated during the time that a cycle of automatic operations is being carried out and locking means are provided which lock the control member against movement during the automatic cycle.

The invention is illustrated in the accompanying drawings in which

Fig. 1 is a plan view of the complete automatic apparatus, the turntable and sound arm being shown in dotted lines for the sake of clearness, the parts being shown in the position for automatic magazine operation, with the record transferring device in the position for engaging a record in the magazine.

Fig. 2 is a plan view of part of the machine with the parts in the position for repeater operation.

Fig. 3 is a plan view showing the greater part of Fig. 1 but with the parts moved through a part of the automatic cycle during magazine operation.

Fig. 4 is a plan view of part of the machine showing the means for effecting the return movement of the sound arm during repeater operation with one standard size of record.

Fig. 5 is a plan view of a part of Fig. 4 but showing the operation of the parts during repeater operation and when dealing with a record of another standard size.

Fig. 6 is a perspective view illustrating the means employed for ejecting a record during magazine operation.

Fig. 7 is a perspective view of the record transferring mechanism in the position of engagement with the uppermost record in the magazine.

Fig. 8 is a view of the parts shown in Fig. 7 but in the position where part of the movement for transferring a record to the playing position has taken place.

Fig. 9 is a view in elevation looking from the left in Fig. 1 and showing the means for operating the record transferring mechanism.

Fig. 10 is a view illustrating the sound arm bearing and the means for initiating the operation of the automatic mechanism when the end of a record is reached.

Fig. 11 is a sectional view of the sound arm bearing.

Fig. 12 shows the sound arm bearing and means for disengaging the needle from a record when the end of the record is reached.

Figs. 13, 14, 15, 16 and 17 illustrate various positions of the sound arm lifting means.

Figs. 18 and 19 are views in elevation showing alternative positions of the means determining the extent of the return movement of the sound box after a record has been played.

Fig. 20 is a plan view of the automatically operated stopping switch in the "on" position.

Fig. 21 illustrates in plan and elevation switch means for stopping the machine during automatic operation when the record magazine is emptied.

Fig. 22 is a view in elevation illustrating the driving motor and the gears connected therewith, the record magazine and part of the record transferring mechanism.

Fig. 23 is an underside plan view of the main operating cam.

Fig. 24 is a diagram of the electric wiring of the machine.

Referring to the drawings, the machine is mounted in a cabinet 1 (Fig. 1) divided into two main compartments 2 and 3, the compartment 2 containing the whole of the mechanism for raising, swinging and lowering the sound arm, for removing a record and for operating the magazine member which brings a new record to the turntable. This mechanism is mounted by means of base plate 4 upon a motor board 5, while the compartment 3 serves as a receptacle for played records.

At the right hand side of the machine is a control lever 74 pivoted at 75 and having a roller 74' co-operating with a spring influenced notch bar 167 pivoted at 167', so that lever 74 can be set for magazine operation (Fig. 1), repeater operation (Fig. 2, full lines) or ordinary operation (Fig. 2, dotted lines).

An electric motor 180 (Fig. 22) furnished with the usual governor 181 and furnished with current through switches described later, drives a vertical shaft 13, carrying the turntable 90. A toothed wheel 22 (Fig. 6) is fixedly mounted on the shaft 13, and with it is adapted to engage a tooth 21 on an arc-shaped clutch lever 17 pivotally mounted by means of a pin 29 on a clutch plate 15 freely mounted on the shaft 13. The means for operating this clutch for initial starting of the automatic mechanism consist of a push rod 163 with button 162, mounted to move horizontally on guide pins 163' on the plate 4, against a pressure spring, and to rock the arm 24 of a lever pivoted at 24' against the action of a spring 25 anchored to the base plate 4 and push the end 23 of the lever out of engagement with the end 18 of the clutch lever 17, so that a spring 19 attached at one end to part 18 and at the other end to stud 20 on plate 15 turns the clutch lever 17 about its pivot 29, and engages tooth 21 with the toothed wheel 22, whereby the plate 15 is driven and will continue to rotate until, on the cycle of automatic operations being completed the clutch is disengaged by the arm 24 which has been moved by its spring 25 to engage again the end of lever 17. The clutch is out during the playing of a record and after a record has been played, the clutch is again engaged, but this time automatically through means (described below) thrown into operation by a reverse movement given to the sound arm after playing a record.

On the underside of plate 15 is carried a gear wheel 14 (Figs. 6 and 22) engaging with a larger gear wheel 16 which drives a shaft 12 journalled in the base plate 4. Mounted on the shaft 12 are the various cams which operate the several elements of the machine that furnish the records to the turntable, lift the sound box at the end of a record, and reposition it for replaying a record or playing a new one, and remove a record from the turntable.

The eccentric cam 11 (Fig. 23) lying immediately beneath the gear wheel 16 co-operates with a cam ring 9 having anti-friction rollers 10 which lie upon the periphery of cam 11, and an arm 7 extending from the ring 9 is pivoted at 8 upon one end of a flat plate 6 (Figs. 1–4, and 13–17) adapted to slide horizontally on a ball or other bearing (not shown) over the surface of the base plate 4.

When the motor has been started and the clutch 17, 22 has been engaged the rotation of the cam 11 causes the plate 6 to reciprocate.

It is the reciprocation of this plate 6 which causes the lifting of the sound box and sound arm, the horizontal movement of the sound arm to take a new position, the lowering of the sound box onto the record, and also the movement of the record conveyor to and fro between the magazine and the turntable.

The means for lifting the sound arm and sound box and lowering same will now be described. Upon the upper surface of the reciprocating plate 6 (Figs. 12–17) is pivotally mounted at 66 a shaped and slotted plate 41. A light spring 67 anchored on plate 6 presses plate 41 against a stop 47'. The forward end 42 of plate 41 is bevelled off downwards towards the plate 6.

This bevelled end 42 co-operates with a roller 43 mounted in a slot in a lever 44 (Fig. 12 and in dotted lines in Figs. 13–16) which will be termed the sound arm lifting lever. This lever 44 is mounted to rock about a horizontal axis, being mounted at one end between studs 45 carried on the base plate 4, and is lifted by the bevelled end 42 of member 41 passing under the roller 43, as the reciprocating plate 6 is moved towards the right in Figs. 1 and 13–16). The free end 46 of the sound arm lifting lever 44 is flared and projects beneath a stud or post 47 (Fig. 12) carried on an arm 48 extending from a collar 54 surrounding the lower thickened end 51 of the vertical elbow portion of the sound arm 27 (see also Figs. 10 and 11). The collar 54 and sound arm 27 have common pivots 49 (Fig. 11) and a limited play is allowed between the collar and sound arm by means of a bolt 57, mounted on the collar 54, and nuts 59 which engage with a ring 58 secured on the sound arm. When the sound arm lifting lever 44 is rocked vertically, the post 47 is lifted and the radial arm 48 and sound arm 27 are rocked about their pivots 49 (Figs. 11 and 12) into the position shown in dotted lines in Fig. 12, to raise the sound box 50 above the playing position. The pivots 49 pass through the thickened end 51 of the sound arm, and through a short tubular member 52 shaped as shown in Fig. 11 to form a ball joint. This tubular member 52 forms a further extension of the sound arm 27 and is itself mounted to rotate in ball bearings 53. The axis of the ball bearing is at a small angle (of the order of 2°) to the vertical in the direction which tends to cause the sound arm 27 and sound box to swing by gravity towards the centre of the record for a purpose explained below.

A coiled spring 55 is provided on one of the pivot pins 49, one end being connected with the collar 54 and the other end to a tensioning nut 56 on the pin 49, so that the outer end of the arm 48 is gently urged downwards away from the sound arm 27. The arrangement is such that the sound arm is capable of a limited vertical movement, to permit the needle to accommodate itself during playing to any irregularities in the level of a record, without affecting the position of the collar 54 and arm 48, and furthermore when there is no record on the turntable the sound box is permitted to drop slightly below the playing position for a purpose to be described later.

The sound arm lifting and lowering mechanism has of course to be operated when a record has been played, whether the machine is working as a magazine machine or as a repeating machine.

In the case of the mechanism being set for magazine operation, when the roller 43 has mounted the bevelled end of plate 41, and lifted the lever 44 and the sound arm 27, it travels along the upper surface 60 (Fig. 14) of plate 41 during further movement of the reciprocating plate 6 in the same direction, and the sound arm 27 therefore remains in the raised position until on the direction of movement of plate 6 being reversed, i. e. moved to the left in Fig. 14, the roller 43 runs down again over the incline 42 of plate 41. It is in the interval between the roller 43 riding up the incline 42 and running down it again that a record is brought from the magazine and placed on the turntable and sound arm is swung outwards.

If, however, the machine is set to operate as a repeater, a lesser interval is required between the raising and lowering of the sound arm, and the path of travel of plate 6 is modified to produce the desired effect. When the control lever 74 and the guide roller 40 carried thereby is moved from the "magazine" position shown in Fig. 1 to the "repeater" position shown in full lines in Fig. 2, the path of the plate 6 and slotted plate 41 mounted thereon is so varied that the roller 43 on the sound arm lifting lever 44, after riding up the wedge-shaped end of the plate 41 (see Fig. 15) shortly thereafter runs down a rearwardly inclined surface 61 on the plate 41 (Fig. 16). The raising and lowering movements of the sound arm 27 in this case succeed one another with a short interval and both take place during movement of the reciprocating plate 6 in one direction, i. e. towards the right in Figs. 15 and 16.

In order however that, during "repeater" operation no lifting of the sound arm 27 shall take place during the return movement of the reciprocating plate 6 the incline 61 during this return movement is brought out of the path of the roller 43, by movement of the plate 41 about pivot 66. This movement is effected as follows: A headed pin or plunger 62 (Fig. 12), is carried loosely in an aperture in the sound arm lifting lever 44, and kept down by a light spring 62' anchored at 62'' on lever 44, so that the end of the plunger projects below the underside of lever 44. When the lever 44 is lifted as above described to raise the sound arm, the plate 41, as it moves to the right, passes freely beneath the plunger 62. When the lever 44 drops owing to roller 43 passing down incline 61, the lower end of the plunger comes to rest upon the surface 63 of plate 41 and it remains there until on further movement of plate 41 towards the right the plunger drops into the space 64, as shown in Fig. 16. During the return movement of plate 6 the plunger 62 will then engage the cam surface 65 on one side of space 64 and the lever 41 will thus be moved about its pivot 66 against the action of spring 67, into the position shown in Fig. 17 out of the path of roller 43 so that the return movement of plate 6 towards the left does not cause the sound arm to be lifted. The spring 67 returns the lever 41 to its normal position against stop 41' when the latter is released by the plunger 62 moving out of the slot 64.

The means for swinging the sound arm back to the starting position after the playing of a record will now be described. The sound arm 27 after being lifted from the record when playing is completed, is swung outwardly by means of a lever 68 (Fig. 3) pivoted at one end on a vertical pin 69 in the base plate 4, and having at a point intermediate its length a downwardly depending pin 70 which engages in a slot 71 in

the reciprocating plate 6, so that movement of plate 6 towards the right moves arm 68 clockwise and sound arm 27 counter-clockwise, for the free end of lever 68 engages the radial arm 48 on the sound arm elbow in a manner described below.

The slot 71 in the plate 6 is of substantially ⌐ shape and the sound arm swinging lever 68 is only moved by the plate 6 when the pin 70 on said lever is in the limb 72 of the slot, Figs. 3 and 4), the movement ceasing when the pin 70 moves into the limb 73.

When the machine is operating as a magazine machine it is necessary that the sound arm 27 shall always move outwards a greater distance than when the machine is in repeater operation, so that the sound arm may be clear of the new record being brought to the turntable.

The extent of movement of the lever 68, which determines the extent of movement of the sound arm 27, depends upon the path of travel of the reciprocating plate 6 for on this depends the time during which the pin 70 remains in what may be termed the active limb 72 of the slot 71.

For magazine operation therefore the path through which the reciprocating plate 6 moves is one which ensures that the pin 70 will traverse practically the whole length of the active limb 72 of the slot 71 before entering the other limb 73.

In Fig. 3 is shown in dotted lines the position of the arm 68 before being moved towards the right by the movement of plate 6. It will be observed that in this position the pin 70 is near to the bottom of part 72 of the shaped slot and in this position it remains stationary until as plate 6 moves to the right the pin 70 is engaged by the left hand edge of part 72 of the slot and the lever 68 is thereby swung in a clockwise direction until the pin 70 enters the part 73 of the slot, when movement of the lever 68 and therefore outward movement of the sound arm 27 ceases. The extent of movement of said pin 70 in the shaped slot is in this case a maximum and the sound arm is therefore swung outward for the maximum distance.

In the case of repeater operation however the sound arm 27 is required to be moved outwards only through a distance which will enable the stylus to be lowered directly on to the edge of the record still on the turntable.

The reciprocating plate 6 therefore, as previously described in connection with the raising and lowering mechanism for the sound arm in repeater operation, is arranged to move over a different path. This reduces the distance travelled by the pin 70 in the active limb 72 of the slot 71, as compared with the case of magazine operation previously described. As will be seen on reference to Fig. 4, showing the setting arm 74 in position for repeater operation, the pin 70 has a less distance to travel to reach the part 73 of slot 71 and bring the arm 68 from the full line position to the dotted position than is the case in Fig. 3.

But while the sound arm is swung outwards a lesser distance for repeater operation and a greater distance for magazine operation, it is also necessary to provide for the needle descending (whether during repeater or magazine operation) in different positions for 10 and 12 inch records. For repeater operation the position at which the needle drops depends on whether the radial arm 48 from the sound arm elbow is pushed outwards by engaging with the end of lever 68, or with a member 138 mounted movably thereon. For magazine operation, the position at which the needle drops depends, not upon the extent to which the arm 48 is pushed outwards but upon the extent to which it is subsequently pulled inwards again.

The mechanism determining these movements is as follows: A lever 129 (Fig. 3) mounted to rock vertically about a pin 195 carried on the base plate (see Fig. 18) has its free end normally urged upwards by a spring 130 arranged between the lever and the base plate 4 and a headed pin 187 secured to the base plate 4 and passing through an aperture in lever 129 limits the upward movement of the latter. The lever 129 has at its left hand end an upturned edge 135, inclined and having a flat 135' at its highest part. A horizontally rocking lever 132 mounted at 133 on the base plate 4 (Fig. 1) is moved either into the position shown in full lines or into that shown in dotted lines by the passage of a 10'' or 12'' record from the magazine, and the roller 134 on the end of said rocking lever either occupies a position on a flat 135' at the upper end of an inclined surface 135 of lever 129 and there depresses the lever 129, or has been dislodged from the flat and pushed down the incline by the lever 129 rising. The manner in which the size of the record passing from the magazine to the turntable determines the position of lever 132 will be described later in connection with the magazine itself.

Carried on the end of the radial arm 48 is an upstanding post 131 (Fig. 10) and this is as will be seen from Fig. 1 adapted to be engaged either by the lever 68 itself or by a T-shaped member 138 pivotally mounted at 138' on said lever 68. The post 131 is of such height that it lies in the path of lever 68 or the member 138 carried thereon when the sound arm has been raised by its lifting mechanism, but it lies out of this path when the sound arm is lowered. The member 138 is pivoted at the base of the T to the edge of lever 68 as shown at 138' in Figs. 18 and 19. On the underside of the cross piece of the T is carried a downwardly extending pin 139 which rests upon the upper surface of lever 129 so that the T-shaped member is raised or lowered about its pivot 138' according to the position of lever 129. The stem of the T of member 138 is undercut so that in the lowered position the cross piece of the T can drop below the upper surface of lever 68 as shown in Fig. 19.

In the raised position of lever 129 (i. e. in the position for a 10'' record) the member 138 is raised to a position where it passes over the post 131 as lever 68 moves outwards (towards the right in the drawings) and consequently the sound arm is moved outwards by contact of post 131 with the edge of the lever 68 itself.

In the lower position of lever 129 (i. e. the position for a 12'' diameter record) the member 138 is lowered and the cross piece of the T (see Fig. 1) acts as a packing piece between the edge of lever 68 and post 131 and the sound arm is moved a greater distance outwards for the same swing of lever 68.

In the case of repeater operation (Figs. 4 and 5) when the lever 132 is in the position shown in full lines in Fig. 1 and lever 129 and packing piece 138 are raised the throw of lever 68 through the engagement of pin 70 in the slot 71 is exactly sufficient to re-position the stylus over or just outside the starting point of a 10'' record, and to reposition the stylus over or just outside the starting point of a 12'' record (Fig. 4) when the lever 132 is in the position shown in dotted lines in

Fig. 1 and lever 129 and packing piece 138 are lowered. A slight inward movement of the sound arm (if required) is caused by the axis of rotation of the sound arm being at an angle to the vertical. If the repetition is to be effected of a record which in the first instance has been automatically transferred from the magazine to the turntable the control lever 74 is moved into the centre notch of catch plate 167, to suitably adjust the path of reciprocating plate 6. The lever 132 in this case is already in the proper position for determining the extent of outward movement of the sound arm. When a record is placed manually on the turntable and it is intended to play it repeatedly it may be necessary to adjust lever 132 by hand.

During magazine operation (Figs. 1 and 3) the throw of lever 68 is sufficient, owing to the increased length of time that pin 70 remains in part 72 of ⌐-shaped slot 71 in plate 6, to move the sound arm 27 outwards whether by the end of lever 68 or the member 138 engaging with post 131 until the stylus reaches a position outside the edge of the largest records. This as previously stated is for the purpose of affording a clear passage for the transferring lever 95 and the record carried thereby from the magazine to the turntable. After the new record has been deposited it is necessary for the sound arm to be moved inwards to a position where the stylus will engage the edge of the ten or twelve inch record as the case may be, before playing can be commenced.

This inward movement is effected by means of a hook 189 pivotally mounted at 189' beneath the end of lever 68. This hook is adapted to engage post 131 only when the sound arm is in the raised position, but during magazine operation it remains in the raised position not only during its movement outwards but also during its movement inwards towards the edge of the record. During the movement of the sound arm outwards urged by lever 68 (or member 138) the hook 189 is caused by means described below to take up a position where it embraces the post 131 and during the subsequent movement of lever 68 inwards the sound arm is moved inwards by the pull of hook 189 upon post 131. The distance moved inwards by the sound arm to engage the edge of a ten or a twelve inch record is determined by the moment at which the pivoted hook 189 is rocked to release post 131 and this is determined by the position of the movable lever 129 previously described. For these purposes the lever 129 carries on its upper surface a pin 140 (Figs. 18 and 19) and a pair of stops 141 and 142 at different positions on the lever and at such distances above the surface of the lever that one or other will occupy a position to engage the hook 189 according as the lever 129 is raised or lowered. These stops 141 and 142 may be formed in one piece as shown in Figs. 18 and 19. The hook 189 is provided with an elongated end or tail 143 (Figs. 3, 18 and 19), and during the outward movement of the lever 68 this tail meets the pin 140 so that the hook 189 is caused to turn about its pivot 189' and to embrace post 131 as shown in full lines in Fig. 3. During the return movement of lever 68 the sound arm is drawn inwards by the hook 189 pulling upon post 131. When the tail 143 of the hook 189 contacts with one or other of the stops 141 or 142, whichever lies in the path of said tail 143, the hook 189 is caused to swing about its pivot 189' on lever 68 and the inward movement of the sound arm ceases. Whether this movement ceases at a point where the stylus is over the edge of either a 10" or a 12" record depends, as previously stated, upon whether the lever 129 carrying the stops 141 and 142 is in the raised or lowered position and this in turn depends upon the size of the record last conveyed from the magazine to the turntable.

During repeater operation the sound arm is always lowered before the return swing of lever 68 commences. Consequently post 131 is unaffected by hook 189 which passes over it.

In the embodiment of the invention illustrated in the drawings the means for removing played records from the turntable are of the known kind embodying a vertically movable post which when raised engages the underside of the record at a point outside the edge of the turntable and lifts said record at one side until its central aperture is clear of the turntable spindle, whereupon the record is slewed off by its engagement with the edge of the rotating turntable at the side opposite to the movable post. This is illustrated in Fig. 6.

The post 76 is mounted to move vertically in a tubular bracket 77 screwed to the base plate 4 by screws 77'.

The post 76 is furnished with a soft pad 78 on its upper end and its lower end rests upon the end 79 of a lever 80 mounted to rock vertically on a pin 81 carried in lugs 82 upstanding from a plate 83 mounted for a reason stated below to turn horizontally about a screw 84 in the base plate 4. On the end of lever 80 away from post 76 is carried a roller 85 adapted, during magazine operation, to roll on a cam 88 mounted to rotate with cam shaft 12. A spring 86 tends to push the outer end of lever 80 upwards. When, during magazine operation the roller 85 reaches the depression 87 in the revolving cam 88, the end 79 of lever 80 rises under the action of spring 86 and lifts the movable part 76 so that the record on the turntable is tilted until it is free of the turntable spindle 13, when it is slewed off by the rotation of the turntable and slides onto an inclined chute (not shown) to the compartment 3 of the cabinet.

When the machine is set to operate as a repeater or as an ordinary machine, the record removing mechanism is rendered inoperative by means of the hand operated lever 74 referred to above, which is connected through a link 91 (see Fig. 2) with the plate 83 whereby the rocking lever 80 when lever 74 is moved, is moved about the screw 84 (Fig. 6) until the roller 85 is removed from the cam 88, the lever 80 then coming to rest upon a post 92 provided for the purpose.

The means employed in the construction illustrated for furnishing records to the turntable during magazine operation will now be described, but these means form the subject of my co-pending application for patent Serial No. 243,713. A pile of records 93 (Fig. 7) which may be of the same or different sizes, and without spacing means between them, is carried upon a fixed plate 184 supported upon an arm 185 (Fig. 1) extending from the base plate 4. A vertical spindle 94 extends through the plate 184 and through the apertures in the records to centre them. A swinging arm 95 (Fig. 7) mounted to rotate with a vertical shaft 96 carried in bearings 97, 98 on a part 99 fixed to the base plate 4, is arranged to swing between positions in which respectively a downwardly extending pin 190 on the arm 95 is vertically over the central spindle 94 of the magazine or vertically over the turntable spindle 13.

Means described below are provided for moving the arm 95 vertically upwards and downwards, and for swinging it horizontally from one operating position to another.

Short hooks, just long enough to hold one disc, on the ends of spring arms 100 radiating from a boss 191 on the underside of the swinging arm 95, operate when the swinging arm 95 is brought vertically downwards on the record pile 93 to grip and raise the uppermost record in the pile and after the arm 95 has been swung into the position over the turntable, as shown in Fig. 3, the hooks release the record which falls on to the turntable 90. Two sets of arms 100 are provided, one to pick up 10" discs and the other 12".

The arm 95 is swung during magazine operation between the record magazine and the turntable by the engagement of a projection 114 (Fig. 1) on the reciprocating plate 6 with the end 113 of a curved lever 101, pivoted to the base plate 4 at 102 and having a curved end 103 (Fig. 7) carrying a downwardly extending pin 104 which passes through an aperture 105 in a block 106 arranged to slide in a yoke 107 carried on a ring 108 on the pillar 96. During magazine operation movement of plate 6 towards the right rocks the lever 101 clockwise and the movement of this lever 101 is normally imparted to the pillar 96 to swing the arm 95 between the magazine and the turntable. The connection between the ring 108 and the pillar is however in the form of a spring catch, the spring 110 being carried on a collar 111 pinned to the pillar 96 while its ball end 112 engages in a depression in the ring 108. Thus the arm 95 may when desired be swung about its axis without moving the lever 101, for the purpose of enabling records to be placed in or manually removed from the magazine.

The passage of a record from the magazine to the turntable determines, according to the size of the record, the position of the sound box when it is lowered on to the record. This is effected as follows:

During magazine operation the position of the lever 132 and consequently lever 129 is determined automatically by and during the passage of the record next to be played, from the magazine to the turntable. If the last record played was a 10" record, the arm 132 occupies the full line position in Fig. 1, or if a 12", the dotted position. On the record carrier 95 swinging to the right with the next record, the latter, even if a 10", will strike the stud 136, and push the roller 134 off the flat 135', when the inclined surface 135 will push it to the other end to the position shown in full lines in Fig. 1. Further movement of carrier 95 towards the turntable with a 10" record has no effect upon lever 132 when in the position shown in full lines as the stud 137 on the other end of lever 132 is out of reach of the edge of a 10" record. In this case therefore the lever remains in the position shown in full lines in Fig. 1 and the lever 129 remains in the raised position.

With a 12" record however, further movement of carrier 95 towards the turntable results in lever 132 being moved into the dotted position, through the edge of the record wiping against stud 137. In this case therefore, the lever 132 is caused to occupy the position shown in dotted lines in Fig. 1 and the lever 129 its lowered position.

In order to allow time for the record transferring arm 95 to rise after the commencement of the cycle of automatic operations and before said arm is swung over the turntable a limited movement of plate 6 is permitted before projection 114 contacts with the end 113 of lever 101 by providing a space between the parts 114 and 113 as shown at 123 in Fig. 1. On the other hand the arm 95 is required to commence its return movement quickly after depositing a record on the turntable and for this purpose an auxiliary lever 124 (Fig. 1) is pivoted at 102 on base plate 4, and one end of this lever is connected to lever 101 by a spring 125 while the other engages a surface 126 on plate 6.

During movement of plate 6 to the right the lever 124 is in contact with the plate 6, moving away from lever 101 under the pull of spring 125 until projection 114 contacts with the end 113 of lever 101 and moves the latter. But immediately the plate 6 begins its return movement the lever 124 and also lever 101, owing to the spring connection between these two, begin their return movement together with the transferring arm 95.

The underside of arm 95 carries a downwardly extending pin 127 (Figs. 7 and 8) which, in the extreme positions of the arm 95, registers with aperture 186 (Figs. 1, 3 and 8) in a part 128 forming an extension of the bearing 97, and the pin 127 enters one or other of said apertures during the rising and falling movements of the arm 95 and guides the latter during said vertical movements.

To alter the machine to operate as a repeater the path of the reciprocating plate 6 is, as previously described, changed by manipulating lever 74, and the projection 114 is raised in Fig. 1 so that during reciprocating movement of said plate 6 it passes the end 113 of lever 101.

The record transferring mechanism in this case therefore remains inoperative.

Vertical movements are imparted to the arm 95 for the purpose of enabling the record transferring means to engage and lift a record to a height sufficient to enable it to be swung horizontally over the turntable and to release the record from the transferring device to allow it to fall on to the turntable. The latter movement however, is small as compared with the former.

The up and down movements are imparted to the arm 95 by a lever 115 (Fig. 9) pivoted on a support 116 extending downwards from plate 4, one end of said lever projecting beneath the lower end of the pillar 96 carrying the arm 95, while the other end carries a roller 117 engaging an inverted box cam 118 (Fig. 22) on the lower end of the cam shaft 12. Two depressions are formed in this cam, one of which 119, permits the lever 115 to occupy at the appropriate time the position shown in dotted lines in Fig. 9 so that the arm 95 can fall by gravity the distance necessary to enable the hooks on the spring arms 100 to grip the edge of the uppermost record in the magazine, while the other depression permits the lever 115 to take up a position such that the arm 95 is free to drop a short distance when over the turntable. The pin 190 is capable of sliding vertically in a sleeve 191' extending below the boss 191 on arm 95. When the arm 95 is lowered, to release a record, the pin 190 strikes the turntable spindle 13, and the pin 190 and a spider 192 rigid therewith are raised with regard to arm 95 and the arms 100 holding the record are spread to disengage the hooks on the arms 100 from the edge of the record, so that the latter falls on to the turntable.

The support 116 for the arm 115 is moved in

the plate 4 by the lever 74 through links 91 and 120 when the lever 74 is placed in the position for repeater operation, so that then the roller 117 on lever 115 is out of the path of the cam 118 and no vertical movements are imparted to the record transfer mechanism.

That end of lever 115 carrying the roller 117 is arranged to rest upon one end of a second pivoted lever 121 (Fig. 9) the other end of which engages beneath the lower end of the vertically movable magazine spindle 94. Thus when the arm 95 of the transferring mechanism is in the raised position, and held there by the cam 118 and lever 115, the spindle 94 is rigidly held raised by the lever 121 and the placing of records on the spindle to form the magazine is facilitated. When however, the arm 95 is lowered the lever 121 is free to rock and the spindle 94 to drop, when the pin 190 is lowered onto it, so that the spring arms 100 can pick up the uppermost record. Springs 122 are provided to balance the weight of the lowering parts.

When it is desired to use the machine as an ordinary manually operated machine, the clutch lever 17 is held out of engagement with teeth 22, so that the automatic mechanism acting on sound arm and magazine is not operated. This is effected as follows: When the control lever 74 is moved into the right hand notch in catch lever 167, it moves the plate 6 to a position where its lower edge in the drawings contacts with a member 144 (Figs. 1 and 2) pivoted on the base plate 4 at 144' and normally pulled in a counter-clockwise direction by a spring 145. The member 144 is thereby rotated about its pivot 144' against the spring 145 and a projection 146 on said member 144 is moved against the end of clutch lever 17 as shown in dotted lines in Fig. 2 and lever 17 is thereby prevented from moving into the clutched position even when detent lever 24 is rocked as previously described.

To prevent manual movement of the magazine arm 95 during ordinary running, a further locking device 47 is connected with the link 120 and when the control lever 74 is moved into the position just referred to, a projection on this member 147 is moved into the path of a lug 124' on lever 124 (Fig. 2) and any possibility of swinging movement on the part of the record transferring mechanism is thereby prevented.

The machine is brought to a standstill automatically after magazine operation when the last record has been removed from the turntable. This is effected by cuting off the current to the motor. For this purpose the ring 58 on the sound arm is provided with a forwardly projecting finger 156 (Figs. 1 and 10) which operates in a manner to be described to open the motor circuit by opening a spring switch 157 (Figs. 1, 21 and 24) formed of a pair of spring arms 158 and 159 normally urged together, the free end 159' of the lower spring 159 being bent upwards and to lie over the end of the upper spring 158. During magazine operation, when the magazine becomes empty the record transferring device 95 moves over the turntable without a record in the same manner as when transferring a record. When the sound arm having been swung outwards, is afterwards moved inwards from its outermost position as previously described and is lowered as when about to engage the stylus with a record on the turntable, the stylus drops slightly below the normal level owing to there being no record to support it. The sound box thereupon swings inwards towards the edge of the turntable owing to the inclination of the axis of the sound arm, and as a result of the additional drop of the sound arm, the finger 156 rests upon the upturned end 159' of the lower switch arm 159, bends this latter down as shown in dotted lines in Fig. 21, so that the contacts are moved apart and the motor circuit broken. The motor and thereby the machine is stopped.

A stop 160 is provided against which the finger 156 abuts to limit the inward movement of the sound arm so that the stylus or sound box shall not scrape against the edge of the turntable.

When the machine is operating as an ordinary manually operated machine, it is stopped after the playing of a record by the mechanism illustrated in Fig. 20, where a detent 151 is employed to retain the moving part 152 of an electric switch in the on position during playing, by the engagement of the detent with a stop 153' on the switch arm 153, the detent 151 being rocked at the end of a record to allow the switch to rotate and cut off the current to the motor.

The detent 151 is rocked, when the end of the record is reached, by the movement of the arm 154 of the clutch detent lever 24, the movement of the arm 154 being transmitted to arm 151' of detent 151 through a stud 155 on extension 148 of lever 74 when the latter is set for operating as an ordinary machine.

It will be clear that this automatic stopping means must not operate to stop the machine when the detent 24 is rocked during magazine or repeater operation and to this end the stud 155 is so mounted on the extension 148 of lever 74 that during magazine or repeater operation the stud is removed from between lever 154 and detent 151, as shown in full lines in Fig. 2, and movements of the former are not transmitted to the latter. The stud is shown in dotted lines in Fig. 2 in the position for operating the stopping mechanism 152. The stud 155 is mounted in such a manner as to be capable of a limited movement in a slot in extension lever 148.

The means for automatically imparting movement in a counter-clockwise direction to detent 24 comprise a ratchet wheel 28 (Fig. 10) mounted to revolve against friction on a pin 28' on arm 166 of detent 24. An arm 48 extending radially from the sound arm carries a plate 26 capable of vertical movement about a pivot 26' (Figs. 10 and 12) on arm 48 but normally tending to move downwards under its own weight. This plate is provided with teeth on its lower edge which teeth engage those of the ratchet wheel 28. The teeth on ratchet wheel 28 and plate 26 are so formed that during normal travel of the sound arm towards the centre of a record the plate can ride over the ratchet without resistance.

But when, owing to the stylus at the end of a record entering an eccentric groove, a reverse movement of the sound arm takes place, the teeth of plate 26 engage the teeth of ratchet wheel 28 and detent 24 is rocked. If the movement imparted to plate 26 is greater than the horizontal movement permitted to wheel 28, by the detent 24, the wheel 28 will rotate against friction sufficiently to permit the additional movement of plate 26. The pivotal connection of plate 26 with arm 48 allows for variations in the height of the sound arm owing to differences in thickness of record and length of stylus and permits the sound arm to drop below the normal level as above described to operate switch 159 after completed magazine operation.

In order to prevent the control lever 74 being moved during the time that the cycle of auto-

matic operations is taking place the extension 148 of said lever 74 (Figs. 1 and 2) is provided with a series of notches 149 into one or other of which a lug 150 on an arm 154 of detent 24 enters when the automatic cycle starts and remains held therein during the cycle, and is held in this position so long as the clutch is in. On the underside of the end 23 of lever 24 is a pin 30, which, when the clutch is out rests in a recess 35 in the inner wall of a ring 31 upstanding from the member 34 rigid with the cam shaft 12. When the detent 24 is rocked either automatically or by the push rod 163 and the clutch put in, the pin 30 is moved from within this recess 35, and since the ring 31 rotates with the cam shaft 12, the recess 35 is moved from a position opposite the pin 30, which is therefore unable to return to its previous position until the cam shaft 12 and the ring 31 have performed a complete revolution, corresponding to the cycle of automatic operation, and recess 35 returns to a position opposite pin 30. Lug 150 on arm 154 therefore locks control lever 74 during the whole of the time that cam shaft 12 is rotating and the automatic operations are being effected.

During revolution of the shaft 12, the pin 30 is guided between the ring 31 and cam 88.

The movement of detent lever 24 in a counterclockwise direction under the action of its spring 25, brings the end 23 into the way of clutch lever 17 and the tooth 21 is disengaged from the plate 15.

With a view to preventing hunting on the part of clutch lever 17 owing to its spring connection with plate 15, when the end of lever 17 suddenly meets end 23 of detent 24, a spring pressed finger 36 pivotally mounted on the upper surface of wheel 16 outside ring 31, is at the appropriate time brought to a position where its free end abuts against the rear surface of the end 18 of arc-shaped lever 17 and the member 36 thus serves as a stop to prevent any tendency that the end 18 of lever 17 may have to move away from the end 23 of detent 24.

If after the machine has last been stopped by the sound arm dropping and opening switch 157, and it is desired to start the machine afresh, this is effected after the magazine has been refilled by pressing upon knob 162 at the front of the machine and rocking detent 24 as previously described to engage the clutch 21, 22. The closing of the motor circuit is automatically effected simultaneously by means of a switch 161 (Figs. 1 and 2) provided in a circuit in shunt with the switch 157, so that the motor circuit can be closed independently of switch 157. This switch 161 comprises a pair of spring arms which rest normally apart, being suitably mounted on the base plate 4. When the detent 24 is rocked by pressing the knob 162, a downwardly extending pin 165 of insulating material on the underside of arm 166 of detent 24 presses the spring arms of switch 161 together. Thus the motor circuit is closed, the motor rotates, and the clutch being engaged the automatic cycle commences. The switch 161 remains closed until the pin 30 on detent 24 re-enters depression 35 when it opens owing to the detent lever 24 rocking counterclockwise, but in the meantime the sound arm has been moved and the other switch 157 is closed by the rising of spring arm 159'.

The automatic operations can also be initiated at any time during the playing of a record by pressing knob 162 to rock detent 24.

In the wiring diagram Fig. 24, A and B are the points of connection of the motor circuit to the supply mains. C is a main switch and the switches 152, 157 and 161 are indicated diagrammatically.

The operation of the machine is as follows: For magazine working the pile of records to be played is placed in the magazine and the main switch C and switch 152 are closed. Control lever 74 is moved to the position where roller 74' engages in the left hand notch of spring-pressed catch lever 167. Knob 162 is pressed inwards to move rod 163 longitudinally so that detent lever 24 is rocked about its pivot whereupon the clutch lever 17 is permitted to take up the clutched position and at the same time the motor circuit is closed through switch 161. The cam shaft 12 rotates and the plate 6 is moved to the right through the action of cam 11 upon ring 9 connected to said plate. The lever 44 is rocked about its pivots in studs 45, by engagement of roller 43 on said lever with member 41, to raise the sound arm and sound box about the axis 49. The lever 68 is swung outwards by the engagement of pin 70 in slot 71 to push the sound arm outwards to the fullest extent and the record ejecting post 78 is lifted but at the commencement of operations of course there is no played record on the turntable to be ejected.

The record transferring device 95 engaged with the uppermost record in the magazine, is first raised by box cam 118 and lever 115 and then swung over from the magazine to a position over the turntable, by the engagement of projection 114 on plate 6 with the end 113 of lever 101, and when this position is reached the record is allowed to fall on to the turntable. The lever 132 is set in the course of this transferring movement as described above, according to the size of the record transferred from magazine to turntable. After the record has been deposited the return movement of plate 6 commences. Transferring device 95 now swings back over the magazine and drops down to the extent necessary to engage the hooks on levers 100 with the now uppermost record in the magazine. At the same time return movement of lever 68 is effected and the sound arm is drawn inwards by engagement of the hook 189 with post 131, to a point where the stylus is over the edge of whatever size record is on the turntable, at which point post 131 is released by hook 189 through the engagement of tail 143 of the hook with one or other of stops 141 or 142. The sound arm is then lowered into engagement with the record through the lowering of lever 44 and playing commences.

The plate 6 moves towards the left until the cam shaft 12 comes to rest through the engagement of pin 30 in depression 35 and the removal of tooth 21 on lever 17 from toothed wheel 22 by the contacting of end 18 of lever 17 with the end 23 of detent 24.

The stylus moves in across the record and when the end is reached a reversal of direction of movement of the sound arm is imparted for example by an eccentric groove as stated above. Thereupon the detent 24 is again rocked this time by the engagement of ratchet 26 with ratchet wheel 28 and the clutch is again thrown in and the cycle of automatie operations is repeated. This process may be repeated as long as any records remain to be fed from the magazine. If during magazine operation it is desired to play a particular record over again one or more times instead of passing on to the next record, control lever 74 is moved until roller 74' engages in the centre notch of catch lever 167. This results in a modification of

the position and subsequent path of travel of plate 6, and also the removal of the record ejecting post 76 from the influence of cam 32 through link 91 and pivoted plate 83.

In this new position of plate 6 the projection 114 is caused to pass the end 113 of lever 101 when the plate 6 moves and the record transferring means therefore remains inoperative. The sound arm, raised by lever 44 as before, is moved outwards by lever 68 but only so far as is necessary to bring the stylus to a position over the commencement of the record to be replayed whereupon it is lowered directly until the stylus contacts with the commencement of the record to be replayed. The sound arm remains unaffected by the return movement of the plate 6 towards the left owing to the automatic deflection of member 41 by plunger 62. In this case the record having been fed originally from the magazine the lever 132 is already set to correctly position the packing piece 138 to give the correct extent of outward movement of the sound arm. If however the record to be repeated is placed on the turntable manually it may be necessary to set the lever 132 by hand to the correct position according to the size of the record to be repeated.

During magazine operation when the magazine is emptied the machine is stopped by the opening of switch 157 through the sound arm dropping to a level below that which it occupies when playing. If however the machine is required to stop at the end of any particular record, the control lever 74 may be moved during playing to the position where roller 74' is engaged in the right hand notch in the catch lever 167. In this position the clutch is held against moving in when the detent 24 is rocked by member 146, so that none of the automatic cycle of magazine or repeater operations takes place. The movement of lever 74 into this position introduces stud 155 between part 154 of detent 24 and detent 151, and the rocking movement of detent 24 when the end of a record is reached is imparted to member 151 and the switch 152 is thereby opened to stop the motor.

What I claim is:

1. In a talking machine of the class described, the combination of sound box lifting, lowering and swinging mechanism, a reciprocable actuating member operatively connected to said mechanism, and means for changing the location of the path of reciprocation of said member to effect changes in the actuation of said mechanism.

2. In a talking machine of the class described, the combination of sound box lifting, lowering and swinging mechanism, record transfer means, a reciprocating actuating member operatively connected to said mechanism and means for actuating the same, and manually operable means for disconnecting said member from said record transfer means.

3. In a talking machine of the class described, the combination of sound box lifting, lowering and swinging mechanism, record transfer means, a reciprocable actuating member operatively connected to said mechanism and means, means for changing the location of the path of reciprocation of said member, and means for disconnecting said member from said record transfer means.

4. In a talking machine of the class described, the combination of sound box lifting, lowering and swinging mechanism, record transfer means, a reciprocable actuating member operatively connected to said mechanism and means, said member having a plurality of paths of reciprocation in one of which said mechanism is actuated for reproducing a plurality of successive records and in another for repeating a record, means for disconnecting said member from said transfer means, means for shifting said member to a selected path of reciprocation, and a manually operable control member operatively connected with said disconnecting means and said shifting means.

5. In a talking machine of the class described, the combination of sound box lifting, lowering and swinging mechanism, record transfer means including a record carrying arm swingable in a substantially horizontal plane, a reciprocable actuating member, and means operatively connecting said member with said mechanism and with said arm.

6. In a talking machine, the combination of sound box lifting, swinging and lowering mechanism, record transfer means including a record carrying arm swingable in a substantially horizontal plane, means for swinging said arm including a lever, a reciprocable actuating member for said mechanism, and a projection on said member adapted to engage said lever to swing said arm.

7. In a talking machine, the combination of sound box lifting, lowering and swinging mechanism, record transfer means including a record carrying arm swingable in a substantially horizontal plane, a reciprocable actuating member for said mechanism, said member having a plurality of paths of reciprocation in one of which said mechanism is actuated for magazine operation and in another for repeater operation, a projection on said member adapted to engage said lever to swing said arm when said member is set for magazine operation, and means for shifting said member to another path of reciprocation wherein said projection clears said lever.

8. In a talking machine of the class described, the combination of record transfer means including a horizontally swingable arm, means for swinging said arm including a lever, a reciprocable actuating member adapted in one direction of its movement to engage said lever to swing said arm, and means operatively connecting said member and lever for simultaneous movement in the opposite direction.

9. In a talking machine of the class described, the combination of record transfer means including a horizontally swingable arm, means for swinging said arm including a lever, a reciprocable actuating member adapted in one direction of its movement to engage said lever to swing said arm, and a second lever resiliently connected with said first lever and having its free end bearing on said reciprocable member.

10. In a talking machine of the class described, the combination of sound box swinging mechanism, a cam for actuating said mechanism, and means for varying the path of movement of said cam to vary the extent of movement of said sound box.

11. In a talking machine of the class described, the combination of sound box lifting and swinging mechanism, including a pivoted lever for swinging said box, a reciprocable actuating member, a cam carried thereby and operatively engaging said lever, and means for controlling the path of reciprocation of said member to vary the amount of movement imparted to said lever by said cam.

12. In a talking machine of the class described, the combination of sound box lifting and swinging mechanism, including a pivoted lever for swinging said box, a reciprocable actuating member having a cam slot therein extending

substantially transversely of the direction of reciprocation of said member, means on said lever disposed in said slot, and means for shifting said member to another path of reciprocation to vary the extent of movement of said means in said transversely extending slot.

13. In a talking machine having a swingable tone arm and a sound box carried thereby, the combination of a post secured to the tone arm, a lever adapted to engage said post to swing the tone arm, a member movably mounted on said lever and movable to a position where it is interposed between said lever and post to vary the amount of movement of the tone arm for a given movement of said lever, and means automatically controlling the position of said member in accordance with the size of a record to be played.

14. In a talking machine having a swingable tone arm and a sound box carried thereby, the combination of a post secured to the tone arm, a pivoted lever adapted to engage said post to swing the tone arm, and a member pivoted on said lever and adapted to be interposed between the same and said post to vary the extent of movement imparted to said tone arm by said lever, and means for automatically controlling the position of said member in accordance with the size of a record to be reproduced.

15. In a talking machine having a swingable tone arm, the combination of a post secured to the tone arm, a pivoted lever adapted to engage said post to swing the tone arm, a member pivoted on said lever and normally interposed between the same and said post, and means controlled in accordance with the size of a record to be played for swinging said member about its pivot to a position where it is clear of said post.

16. In a talking machine having a swingable tone arm, a post secured to the tone arm, a tone arm swinging lever adapted to engage said post, a member pivoted on said lever about a substantially horizontal axis and normally interposed between said lever and said post, a second lever adapted to engage and lift said member to a position where it passes above said post when said tone arm swinging lever swings into engagement therewith, and means for controlling the position of said second lever in accordance with the size of a record to be played.

17. In a talking machine having a swingable tone arm, the combination of a post secured to the tone arm, a tone arm swinging lever adapted to engage said post, a member movably mounted on said lever and normally interposed between the same and said post, means for moving said member to a position where it clears said post when said lever moves into engagement therewith, record transfer means, and means adapted to be engaged by a record carried by said transfer means and operatively connected to said moving means to control the position of said member.

18. In a talking machine having a turntable and a swingable tone arm, a post secured to the tone arm, a tone arm swinging lever adapted to engage said post to swing the tone arm clear of the turntable, a hook pivoted on said lever to engage said post to return said tone arm toward the turntable, stop means movably positioned in the path of movement of said hook to release said post, record transfer means, and means adapted to be engaged by a record carried by said transfer means and operatively connected to said stop means to control the position thereof in accordance with the size of a record to be played.

19. In a talking machine having a turntable and a swingable tone arm, the combination of a post secured to the tone arm, a tone arm swinging lever adapted to engage said post to swing the tone arm clear of the turntable, a hook pivoted on said lever to engage said post to return said tone arm toward the turntable, a pair of stops mounted for movement in a substantially vertical plane, and means for moving said stops to position one or the other thereof in the path of movement of said hook.

20. In a talking machine of the class described, the combination of a sound box lifting lever, a reciprocable actuating member, a lifting cam carried by said member to engage and lift said lever on movement of said member in one direction and to lower said lever on further movement in said direction, and means to deflect said cam clear of said lever on reverse movement of said member.

21. In a talking machine of the class described, the combination of a sound box lifting lever, a reciprocable actuating member, a cam member pivoted on said reciprocable member and having a cam surface adapted to engage and lift said lever on movement of said reciprocable member in one direction and to lower said lever on further movement in said direction, a second cam surface on said cam member, and means on said lever to engage said second cam surface on reverse movement of said reciprocable member and to deflect said cam member to a position where said first named cam surface does not engage said lever.

22. In a talking machine of the type adapted for operation either as a magazine machine or as a repeater, a single control member adjustable to different positions to selectively control the operation of the machine, means movable on completion of reproduction of a record to initiate a cycle of automatic operations, and cooperating locking means on said movable means and said member for locking said control member in adjusted position throughout a cycle of operation.

23. In a talking machine having actuating means adapted for operation of the machine either as a magazine machine or as a repeating machine, a driving motor, a clutch drivably connecting said motor and actuating means, a pivoted lever movable to disengage said clutch, a control lever operatively connected to said actuating means and adjustable to different positions to selectively control the operation of the machine, and cooperating means on said control lever and pivoted lever, said means being engaged when said pivoted lever is moved to clutch disengaging position to lock said control lever in its adjusted position.

24. In a talking machine of the type adapted to play a plurality of records in succession or to repeat a record and embodying a rotatable turntable and actuating means for shifting the sound box and for changing records, the combination of an electric motor for driving said actuating means and turntable, a detent for said actuating means, means actuated by tripping said detent to close the circuit of said motor, and means for closing said motor circuit independently of said last named means.

25. In a talking machine of the type adapted to play a plurality of records in succession or to repeat a record and embodying actuating means for changing records and shifting the sound box, the

combination of a driving motor for operating said actuating means, a clutch for operatively connecting said motor with said actuating means, a detent normally maintaining said clutch disengaged, a starting switch for said motor, means operatively connecting said starting switch and detent to close said switch when said detent is tripped, a second switch connected in circuit with said motor, and means for actuating said second switch independently of said last-named means.

26. In a talking machine of the type adapted to play a plurality of records in succession or to repeat a record and embodying actuating means for changing records and shifting a sound box, the combination of a tone arm mounted for vertical and horizontal movement and movable to a position below playing position, a driving motor operatively connected with said actuating means, a detent for said actuating means, a motor switch, means on said tone arm adapted to open said switch when the tone arm falls to a position below playing position, a starting switch in shunt with said first named switch, and means operatively connecting said starting switch and said detent to close the starting switch when the detent is tripped.

27. In a talking machine of the type adapted for operation as a magazine machine, a repeating machine or an ordinary machine and embodying actuating means for changing records and shifting a sound box, the combination of a driving motor, a clutch for operatively connecting said motor to said actuating means, a detent normally maintaining said clutch disengaged, means for tripping said detent when the sound box reaches the end of a record, a control member adjustable to different positions to selectively control the operation of the machine, and means actuated by movement of said control member to a position for operation as an ordinary machine to prevent engagement of said clutch when said detent is tripped.

28. In a talking machine of the type adapted for operation as a magazine machine, a repeating machine or an ordinary machine and embodying actuating means for changing records and shifting a sound box, the combination of a driving motor, a clutch for operatively connecting said motor to said actuating means, a detent normally maintaining said clutch disengaged, means for tripping said detent when the sound box reaches the end of a record, a control member adjustable to different positions to selectively control the operation of the machine, means actuated by movement of said control member to a position for operation as an ordinary machine to prevent engagement of said clutch when said detent is tripped, a motor switch, and means operated by said detent to open said switch.

29. The combination with a phonograph adapted to reproduce a plurality of records in succession or to repeat a record and embodying actuating mechanism for shifting the sound translating device and for changing records, of an electric motor for driving said mechanism, a pair of switches in circuit with said motor, one of said switches being normally open and the other normally closed, means for maintaining said other switch open during idle periods of the phonograph whereby both switches remain open when the phonograph is idle, a detent for said mechanism, said detent including means for closing said normally open switch, means for tripping said detent and for causing said last named means to temporarily close said normally open switch whereby to complete the motor circuit, and means for thereafter rendering said first named means inoperative to maintain said other switch open whereupon said other switch becomes closed to retain the motor circuit completed independently of said normally open switch.

30. The invention set forth in claim 29 characterized in that the means for maintaining the normally closed switch open is operatively associated with the sound translating device for movement therewith.

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